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GREY WATER DISPOSAL FROM PLEASURE BOATS

Background information on the amendment of
Regulations 305 and 310 made under the
Environmental Protection Act

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I INTRODUCTION

Recreational boating has increased rapidly in the last few years, and is expected to continue to grow in popularity. Regulation 305, made under the Environmental Protection Act, prohibits the discharge into the water of sewage from pleasure boats. Sewage includes toilet waste ("black water"), but does not include "grey water" i.e., household waste water from sinks, showers, etc. Concern has frequently been expressed as to the effects of the direct discharge of this grey water to our lakes and rivers.

This report presents the background to the Ministry of the Environment's decision that Regulation 305 should be amended to prohibit also the discharge into the water of grey water from all pleasure boats. The definition of "sewage" in Regulation 310 will also be amended accordingly. The decision takes into account the results of a study of grey water from pleasure boats made by Beak Consultants Limited, acting under a contract with the Ministry of the Environment.

This report briefly summarizes the Beak study; a longer summary appears as Appendix 1. It is hoped that for the majority of interested people, this longer summary will give sufficient information, since the full Beak report is rather technical for the lay person. However, for those who wish it, the full study is available from the Communications Branch of the Ministry of the Environment.

II THE STUDY BY BEAK CONSULTANTS

1. Background

Beak Consultants Limited, acting for the Ministry of the Environment, analyzed grey water from pleasure boats in order to determine its biological and chemical characteristics, as well as the amounts produced. Most of the samples analyzed were taken from fittings on board the boats, but samples were also taken from the waters of three enclosed embayments where many boats were moored. The consultants also surveyed the capacity of marina pump-out stations in five popular boating areas of Ontario, to assess what reserve capacity was available in the existing pump-out network, in the event that it was decided to require that grey water also be retained and pumped out at the pump-out facilities. The areas surveyed were within the Trent and Rideau Canal systems, southern Georgian Bay, Toronto area and Lake of the Woods.

2. Grey Water

Analysis of on-board grey water showed a density of E.coli. of between 6 x 10^2 and 6 x 10^6 (i.e., 600 to 1 million) per 100 ml. While the Ministry of the Environment's publication on Water Management, known as the "Blue Book", contains no objective for E.coli in recreational waters, that for fecal coliforms is 100 per 100 ml. E.coli are included within the general category of fecal coliforms. They are unmistakable evidence of fecal contamination by warm-blooded animals. Although such discharges of grey water are relatively low in volume, because of the high concentration, there is a definite potential for fecal contamination of receiving waters, especially at the local level.

Pseudomonas aeruginosa levels on-board were very significant, at 10^3 to 10^6 (i.e. 1000 to 1 million) per 100 ml. Normally occurring environmental densities of this organism are typically less than 50 organisms per 100 ml. This is a known pathogen (disease causing organism), which the Blue Book states is a potential health hazard if found in recreational waters. It causes ear and eye infections in swimmers.

In view of the fact that fecal and potentially pathogenic organisms were found in grey water, it is highly likely that other pathogenic organisms, such as salmonella, are also present in grey water, (although they were not tested for).

"Conventional" chemical pollutants (nutrients, solids, and oxygen-demanding substances), while relatively small in volume from each boat, also have the potential for local contamination of receiving waters, due to their high concentrations.

The production of grey water on pleasure boats varied between 4.8 and 31.8 litres per person per day, depending on the type of boat and the crew (see Appendix 3, Fig. 3-3). (A realistic estimate might be in the range of 15 to 18 litres per person per day.) In any calculation of holding tank capacities, it must be borne in mind that if grey water is required to be stored on board pleasure boats, it is likely that the crew could - and very likely would - choose to reduce water use significantly.

("Black water" production from toilets is estimated at 10 litres per person per day.)

With regard to the analysis of water samples from the embayments, no statistically significant relationship between the number of boats in an embayment and the bacterial density was found. This is really not surprising, since there are many unknown and/or uncontrollable variables. However, the obvious inference from the studies is that the larger the number of boats relative to the size of the embayment, the more significant will be the impact on the water in that embayment.

3. Marine Pump-out Capacity

There appears to be a significant excess in pump-out capacity along the major recreational waterways of the province. In the five popular recreational waterways studied, the average use of pump-out stations available to the public was only 20% of the available capacity.

No reasons for the low usage of pump-out stations are stated in the Beak study, and they are a matter for speculation. In some cases it may be due to factors such as inconvenience of access. In the more popular areas perhaps boaters use the more readily available toilet and food facilities on land, rather than those on their boats.

These pump-out stations seem to be reasonably distributed in the popular recreational areas mentioned above, but in certain other areas, notably northern Georgian Bay, the North Channel and Lake Superior, there are too few pump-out stations to provide a convenient network for touring boats.

III CONCLUSION AND RECOMMENDATION

It may be concluded from the study that the discharge of grey water adds to the general degradation of water quality, increasing the concentration of bacteria, nutrients and BOD, and of pathogenic organisms. It is therefore recommended that measures be taken to prevent or mitigate its discharge.

IV ALTERNATIVE COURSES OF ACTION

The following is a list of alternative courses of action which were considered. They will be discussed in more detail below:

1. No action.

2. Grey water treatment combined with low-phosphate soaps and detergents.

3. All boats to retain grey water, but only when located in certain designated sensitive waterways of the Province.

4. Certain types of boats, either new or existing, to retain grey water after specified date(s).

5. Only new boats (after a specified date) to retain grey water.

6. All boats, including existing boats, to retain grey water after specified date(s).

V DISCUSSION OF ALTERNATIVES

1. Alternative 1: No Action

Comment:

- Questions are frequently asked as to why cottages or houses alongside a lake must dispose of their grey water within expensive septic systems, which are also regulated under the Environmental Protection Act (Part VII), while boaters on that same lake may discharge their grey water overboard.

- In view of such public perceptions, and the conclusions drawn from the Beak study, this alternative is not realistic. It would lead to further degradation of the waterways, and increased public dissatisfaction.

2. Alternative 2: Grey water treatment combined with low phosphate soap/detergents

The grey water would be disinfected and discharged directly to the lake or river. There are two optional ways in which this might be done. The grey water would be:

(a) collected and disinfected in a holding tank on-board, and then discharged; or

(b) disinfected and discharged at once (i.e. no holding tank).

Comments:

- The Ministry of the Environment has consistently rejected the on-board treatment of black water by equipment such as macerator-chlorinators, which grind up the solids in the sewage and chlorinate them before discharge. The efficiency of chlorine disinfection is vastly decreased in the presence of suspended solids, organic material and ammonia, all of which are present at high levels in macerated black water. Chlorine is rendered virtually useless under such conditions.

- With regard to Option (a) above, grey water normally contains a certain amount of debris, soil and suspended solids. Chlorine, the most likely disinfecting agent, would be added to the tank, some mixing would be applied, and the whole would then be discharged. While this provides some time for the chlorine to be in contact with the grey water, chlorine is unlikely to be very effective under such conditions, due to the presence of particulate material, organics, etc. It is also likely that the sediment in the tank would become odorous unless cleaned out regularly.

On a practical basis, if a holding tank is in any case to be provided for treatment, the tank contents might just as well be held for pumpout rather than disinfection and discharge.

- Option (b), where chlorine would be added on discharge, does not provide for any contact time for the chlorine, and thus would result in even less effective disinfection than Option (a).

  Once the chlorine is discharged into the river or lake, it at once becomes diluted and totally ineffective.

- Apart from these objections, on-board treatment facilities require careful maintenance, which is hard to enforce.

- The discharges would contain organics, solids, phosphates, etc., as well as chlorine, and most would likely be most frequent when the boats are at anchor. Anchorages are usually in areas where water is shallow and warm, with little water flow or exchange. It is under such circumstances that discharges would have the greatest impact on water quality.

- The use of low-phosphate soaps and detergents, while lessening the problem, does not eliminate it. An aesthetic problem also still remains. It would be very difficult to enforce the use of these low-phosphate materials, as the enforcement officer would have to find and examine all the soap and detergent containers on the vessel. Even if this were done, unless the soap or detergent were in their original containers, it would be difficult to be sure that they were actually low phosphate, without taking them away for analysis.

3. Alternative 3: All boats to retain grey water in designated sensitive waterways

This might include confined areas such as the Rideau Canal and the Trent-Severn Canal, Bay of Quinte, and perhaps part of the southern end of Georgian Bay. Boats which operated in such designated waters would have to have either temporary or permanent grey water holding tanks.

Comments:

- This would be very difficult to control.

  Boats move from area to area, and there would have to be permanent policing at the "gateway" - if such exists - to these areas (and within them).

- In addition, there are a large number of smaller sensitive areas, many of them on the Great Lakes, which would be very difficult to police. It would be very difficult to establish criteria to decide on such areas, and a mechanism would be needed to deal with public demand for extensions to sensitive areas or the establishment of new ones.

4. Alternative 4: Certain specified types of boats to retain grey water

It has been suggested that this might apply only to houseboats (which have been the subject of numerous complaints), or alternatively also include boats over a certain length, or displacement:

Comments:

- Public concern has been expressed about houseboats out of all proportion to their actual numbers (when compared to other boats). However, it could be that this public concern has its roots mainly in concerns other than water quality protection (e.g. the behaviour of some of the crews of rented houseboats).

- It is difficult to arrive at a legal definition of houseboats, since most of their characteristics are actually common to several types of boat.

- It is usually easier to install extra holding tanks on houseboats than on other boats.

- Houseboats make up only a very small proportion of the total number of boats, perhaps only 1.5% (although commercial houseboats are, admittedly, normally used very intensively in the summer months).

- Houseboats in the Beak study did not appear to use more water per crew than any of the other boats.

- Therefore, strictly from the point of water quality protection, houseboat owners might well ask why they had been singled out.

- Since the vast majority of boats discharging grey water are power boats and sailboats, it would be unreasonable to exempt one or other type from the proposed regulation, nor if, for example, length or size of boat were the criterion, would it be easy to decide where to draw the line equitably.

5. Alternative 5: All new boats to retain grey water after a specified date

Comment:

- The argument in favour of this alternative is that the storage tanks could be built in at the time of construction, thus causing little inconvenience to the owners. However, a reasonable estimate of existing boats, 6 m or over in length, with fitments using grey water in Ontario waters is 45,000 - of which perhaps only 600 are houseboats.

- Therefore, since present-day boats are constructed of modern long-lived materials, it would be a long time before this alternative would have any significant effect on the recreational waters.

6. Alternative 6: All boats with fitments capable of producing grey water to retain the grey water after a specified date

Comment:

This is the preferred alternative, as it will lead to maximum environmental protection, would be seen to be equitable since it avoids favouring one type of boat over the others - and is simple to enforce.

The main problem will be difficulties in installing holding tanks in some types of existing boats.

It should be noted that certain lakes in New York State and New Hampshire have regulations against the discharge of grey water into the lake from pleasure boats.

The question of the compliance of U.S. and other out-of-province boats must be considered. However, it would be difficult to justify the exemption of these boats, since the present regulation is already applied to all boats, regardless of their origin. The Ministry could not reasonably appear to be condoning pollution. U.S. and other suppliers already can supply boats adapted to the requirements of the existing Ontario Regulation.

It is likely that some owners, particularly U.S. ones, would be content to alter the plumbing so as to make use of their existing black water tanks (i.e., not add a separate grey water tank or enlarge their existing black water tank), and either arrange for more frequent pump-out, or practise greater economy of water use.

VI PROPOSAL

It is proposed that, in addition to the present retention of black water, grey water also be retained in tanks aboard pleasure boats, and pumped out at marine pump-out stations. The boating and marina regulations (regulations 305 and 310 under the environmental protection act) to be amended accordingly.

VII DISCUSSION OF PROPOSAL

1. A previous study into the issue of grey water discharges from recreational vessels was carried out for the Ministry by MacLaren Engineers in 1987. It was based on a literature review only of analyses of grey water, a quick review of pump-out station availability in Ontario (both of these being superseded by the field studies of the Beak Study), and the Consultants' own analysis of types of boat and their plumbing systems (see Appendix 4).

   It was noted that where existing boats are concerned, it is much easier to install holding tanks for grey water in houseboats than in other types of boat. With regard to houseboats, where the holding tank is usually located below the platform of the cabin floor, grey water flow to the tank may usually be accommodated using gravity drains. However, retrofitting of holding tanks on existing houseboats, and their provision on new boats, were stated as being capable of being carried out reasonably inexpensively. Power cruisers and sail boats, due to the tapered shapes of their hulls, and the more complicated plumbing required, would cost considerably more.

Figures quoted (in 1987 dollars) in the MacLaren study were as follows:	1987 $	MOE Estimation: 1991 $
- Retrofitting an existing power cruiser or sailboat (plumbing changes only, no increased retention capacity; grey water goes into existing black water tank)	$ 500 - 700	$ 700- 950
- Fitting a new large houseboat with a retention capacity of 200 litres more than that presently fitted	$ 600	$ 800
- Fitting a new power cruiser or sail boat with a retention capacity of 30 litres (galley only) to 80 litres (galley and shower) more than is presently fitted	$ 600 - 900	$ 800-$1,200
- Retrofitting an existing power cruiser or sailboat with tanks to retain an additional 200 litres	$1,100*-1,200* (NOTE)	$1,500-$1,600
- Retrofitting a large existing houseboat with tanks to retain an additional 200 litres	$1,000	$1,400

*NOTE: The $ figure for retrofitting an existing sailboat is based upon an actual conversion carried out by a contractor for a staff member of the Consultants (MacLaren Engineers Ltd.).

2. It is proposed that the requirement for all boats to retain their grey water will apply about two years after a due date stated in the proposed change to Regulation 305. This would allow for the alteration of existing boats and the amendment of designs for those about to be constructed.

3. While the retroactive application of new regulations is relatively unusual, in this case there is little choice. To exempt existing boats would mean the continued discharge of a very significant amount of grey water into the recreational waters given the large number and long life of modern boats.

VIII AVAILABILITY OF PUMP-OUT STATIONS

1. Based on the Beak study, it seems likely that for the present there will be adequate pump-out facilities along many of the major recreational waterways. However, in areas with few pump-out facilities, e.g. north-east Georgian Bay, North Channel, and Lake Superior, new pump-out facilities will still be required.

2. More marinas with pump-out facilities are slowly being added (e.g., by the federal government) in areas noted above where they are scarce. However, this is a slow, and will possibly be an incomplete, process. The government should therefore consider measures to encourage the provision of new pump-out stations, particularly in the areas which are deficient in them.

APPENDICES

APPENDIX 1

MORE DETAILED ANALYSIS OF STUDY BY BEAK CONSULTANTS

A. INTRODUCTION

1. Recreational boating has increased rapidly in the last few years, and is expected to continue to grow in popularity. Regulation 305, made under the Environmental Protection Act, prohibits the discharge into water of sewage from pleasure boats. Sewage includes toilet waste ("black water"), but does not include "grey water", i.e., household waste water from sinks, showers, etc. Concern has frequently been expressed as to the effects of the direct discharge of this grey water to lakes and rivers.

2. The Ministry of the Environment commissioned Beak Consultants Limited to do a study. The study, begun in the summer of 1987, analyzed samples of grey water from various boats, in order to determine the bacteriological and chemical characteristics of the grey water, as well as the amounts produced. For this purpose, three different types of boats: a sailboat, a power boat, and a houseboat were chartered for approximately three weeks each, and each boat was crewed by three different crews, some with children and some without, so as to be as near real life as possible. Each boat had a shower and a sink in the toilet compartment, and a galley sink for kitchen use.

3. Bacterial analysis was for the following: fecal coliforms, E.coli, Pseudomonas aeruginosa (every sample), and fecal streptococci (lesser number of

samples). Chemical analysis, also for a lesser number of samples, was carried out for the following: total phosphorus (as P), soluble phosphorus (as P), total solids, suspended solids, BOD_5, total organic carbon, chemical oxygen demand, ammonia (as N), and total kjeldahl nitrogen (as N).

4. Samples of water from three bays ("embayments"), two in southern Georgian Bay and one in the Trent Canal System, were analyzed for fecal coliforms, E.coli, and Pseudomonas aeruginosa. The idea was to see what effect the discharge of grey water might have on the receiving water. These bays were therefore chosen for their great popularity as anchorages, and the fact that they were small, apparently free of bacterial inputs other than from the boats, and with a very limited exchange flow with the surrounding water. Samples were collected from 10 pre-selected locations within each embayment, and at one control point outside the embayment.

5. A survey of marine pump-out capacity was also undertaken, to assess what reserve capacity was available within the existing pump-out network. The reason for this was in case, as a result of the study, the Ministry were to require that grey water be retained on board pleasure boats, and pumped out at pump-out stations (as is now the case with black water). The areas surveyed (see attached Fig. 2-1, Appendix 2) were:

   - Trent System (Peterborough to Rosedale)
   - Kingston area and Rideau System (Kingston to Smiths Falls)

- Southern Georgian Bay (Penetanguishene to Honey Harbour)
- Toronto area (Bronte to Oshawa)
- Lake-of-the-Woods (Morson to Keewatin).

B. RESULTS OF STUDY

1. On-Board Samples:

(See Appendix 3, Figs. 3-1 to 3-5)

- The original ("presumptive") analysis of the grey water showed that the fecal coliform count exceeded, by several orders of magnitude, the Ministry of the Environment's objectives for recreational water use. This objective, as set out in the Ministry's publication on Water Management (the "Blue Book"), is 100 fecal coliforms per 100 ml of water. Densities ranged from 10^4 to 10^8 organisms per 100 ml for fecal coliforms.

- However, the "presumptive" testing procedure mentioned above, which is the one normally utilized by the Ministry to indicate whether fecal coliforms are present, may in certain circumstances yield misleading results. In this case, more detailed "confirmatory" tests were undertaken, and this ("taxonomic") analysis indicated that only 6% (i.e. 6×10^2 to 6×10^6 per 100 ml) of what were apparently fecal coliforms in grey water were unequivocally of fecal origin, i.e. E.coli.

- Presumptive analysis showed that Pseudomonas aeruginosa ranged from 10^3 to 10^6 organisms per 100 ml, and taxonomic analysis confirmed this. It was found both in on-board samples, and in the receiving water of the embayments, as well as the control sites. (Normally occurring environmental densities of Pseudomonas aeruginosa are typically less than 50 organisms per 100 ml.)

- No single plumbing fixture could be identified as being consistently higher in bacterial density than any of the others. However, on many occasions, the galley sink densities were the highest. Similarly, no single type of boat exhibited higher bacterial densities than either of the other boat types studied.

- Grey water from all three fixtures on board the boats exhibited high concentrations of "conventional" pollutants (nutrients, solids, and oxygen-demanding substances). Because of the relatively small volumes involved, the mass loadings from each boat of these substances on receiving waters would be small.

2. Samples in the Embayments:

(See Appendix 3, Fig. 3-6)

- Fecal coliform concentrations in the two most enclosed embayments were observed to rise to levels in excess of the Ministry's "Blue Book" objectives for the recreational use of water, during the summer weekend studied. However, as mentioned above, only a small percentage of this was unequivocally of fecal origin. Substantial levels of P. aeruginosa were observed for all three embayments. Background levels in samples taken from control locations, particularly for P. aeruginosa, were observed to vary considerably, at times exceeding the levels in the embayments.

- No statistically significant, simple, relationship between the number of boats in an embayment and bacterial density of the three bacterial species analyzed (fecal coliform, E.coli, and P. aeruginosa) could be found in the data collected in this survey. The effects of grey water upon the bacterial quality of embayment waters are highly site-specific: in small heavily used embayments, specific effects can be observed: in larger, less used or better flushed locations, specific effects cannot be observed.

3. Grey Water Production

- Fresh water use, and therefore grey water produced by the crews aboard the boats varied between 4.8 and 31.8 litres/person/day, depending on the boat and crew (see Appendix 3, Fig. 3-7). (The toilets are flushed with water drawn from the river or lake. Such "black water" production is estimated at 10 litres/person/day.) The large variations presumably reflect individual lifestyle differences of the crews. The only limitation on the crews' use of water was the size of the fresh water holding tanks, since the grey water was allowed to flush freely into the river/lake. It is therefore very likely that if grey water had to be stored in (limited) tanks on board, the crew would more carefully control its water use, and therefore significantly less grey water would be produced.

4. Pump-out Capacity:

- There appears to be a significant amount of excess pump-out capacity along the major recreational waterways of the province. In the five popular recreational waterways studied, the average use of pump-out stations available to the public was only 20% of the available capacity (see Appendix 3, Figure 3-8). Possible reasons for this under-utilization are discussed below (page 24).

- The Report states that, in estimating the available capacity of the pump-out stations, the limiting factor was taken as the number of boats that could be serviced using the existing pump-out equipment, rather than the volume of sewage received. This is because nearly 90% of all pump-out stations are either on main sewers or (as in the great majority of cases) served by holding tanks on shore, which can simply be emptied more frequently if greater volumes of sewage are received.

- These pump-out stations seem to be reasonably distributed in the popular recreational areas mentioned above, but in other areas, notably northern Georgian Bay, the North Channel and Lake Superior, there are too few pump-out stations to provide a usable network for touring boats.

C. DISCUSSION

1. Very significant levels of Pseudomonas aeruginosa were found in the on-board samples. This is a known opportunistic (i.e. non-virulent) pathogen (i.e. disease-causing) organism which causes ear and eye infections in swimmers. There is no Ministry of the Environment standard as such, but the "Blue Book" states that a potential health hazard exists if it can be enumerated and frequently isolated from recreational waters.

2. Only a small percentage (6%) of what were apparently fecal coliforms was shown to be unequivocally of fecal origin. Nevertheless, there is a potential for fecal contamination of the receiving waters, especially at the local level, because of the high concentrations of these fecal coliforms (including E.coli). Presence of E.coli is definite evidence of fecal contamination by warm-blooded animals. Again, there is no Ministry standard for E.coli. for recreational waters, but that for fecal coliforms (within which E.coli are included) is 100 fecal coliforms per 100 ml of water.

3. In view of the fact that organisms of fecal origin and potentially pathogenic organisms were found, there is also the likelihood of other pathogenic organisms (for which no analysis was undertaken in this study), being present in grey water. For example, although salmonella was not tested for in the study, it is likely to be contributed to grey water in the galley sink when food (e.g. poultry) is prepared.

4. In the same way, due to the high concentration of chemical and biochemical contaminants, such as nutrients (including phosphorus), solids and oxygen-demanding substances, there is also the potential for contamination of the receiving waters.

5. Owing to the number of variables - either unknown or uncontrollable - it is not surprising that the results from the samples of water taken from the embayments were hard to evaluate. However, the obvious inference of the report is that the larger the number of boats relative to the size of the embayment, and the more static the water flow, the more significant will be the impact on the waters of the embayment.

6. In a more general sense, grey water certainly adds to the general degradation of water quality due to the increases in concentration of bacteria, nutrients and the BOD (biochemical oxygen demand). Grey water is included in the sewage which is regulated under Section 24 of the Ontario Water Resources Act, and Part VII of the Environmental Protection Act. The latter is of particular significance, since it is concerned with on-site sewage systems, (generally septic systems).

7. Reasons for the low usage of pump-out stations are not stated in the Beak study and are a matter for speculation. In some cases it may be due to factors such as inconvenience of access. It is also possible that in the more popular areas boaters use the more readily available toilet and food facilities on land, rather than those on the boat.

APPENDIX 2

MAP

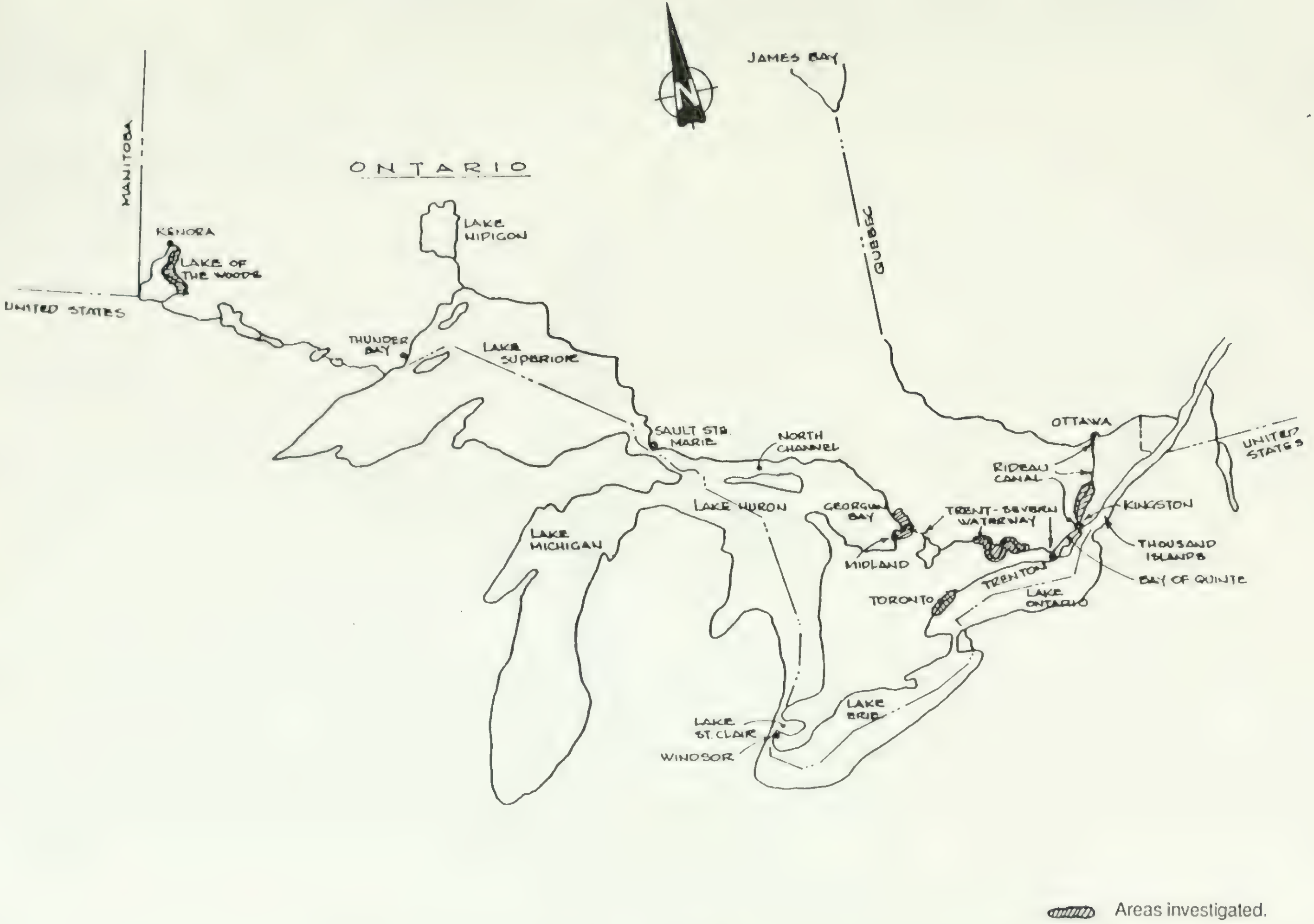


Fig. 2-1 AREAS OF PUMP-OUT STATION INVESTIGATION

APPENDIX 3

TABLES FROM STUDY BY BEAK CONSULTANTS

APPENDIX 3

TABLES FROM STUDY BY BEAK CONSULTANTS

Crew	Fixture	FECAL COLIFORMS Geo Mean Concentration (/100 ml)	FECAL COLIFORMS Mean of Log	FECAL COLIFORMS Variance of Log	E. COLI Geo. Mean Concentration (/100ml)	E. COLI Mean of Log	E. COLI Variance of Log	PSEUDOMONAS AERUGINOSA Geo. Mean Concentration (/100ml)	PSEUDOMONAS AERUGINOSA Mean of Log	PSEUDOMONAS AERUGINOSA Variance of Log
HOUSEBOAT										
1	GALLEY	1.40×10^{7}	7.146	0.662	1.07×10^{7}	7.028	0.918	9.42×10^{2}	2.974	0.590
2	GALLEY	6.54×10^{8}	8.816	0.148	2.68×10^{8}	8.428	0.152	1.71×10^{4}	4.234	2.835
3	GALLEY	1.94×10^{8}	8.288	0.292	6.14×10^{7}	7.789	0.406	1.00×10^{4}	4.000	0.286
1	HEAD	2.99×10^{6}	6.476	1.787	2.24×10^{6}	6.349	1.637	1.09×10^{3}	3.037	0.780
2	HEAD	1.34×10^{7}	7.128	0.052	3.22×10^{6}	6.508	0.274	1.43×10^{4}	4.156	0.153
3	HEAD	9.88×10^{6}	6.995	0.064	2.57×10^{6}	6.409	0.237	3.07×10^{4}	4.488	0.198
1	SHOWER	1.23×10^{6}	6.088	1.279	4.56×10^{5}	5.659	1.431	1.86×10^{2}	2.269	0.437
2	SHOWER	1.49×10^{7}	7.173	0.272	5.37×10^{6}	6.730	0.463	4.58×10^{3}	3.660	0.922
3	SHOWER **	4.69×10^{5}	5.671	0.001	4.53×10^{5}	5.656	0.002	3.00×10^{4}	4.476	1.856
POWERBOAT										
4	GALLEY	6.19×10^{7}	7.792	0.756	5.30×10^{7}	7.724	0.654	3.51×10^{5}	5.545	2.198
5	GALLEY	1.16×10^{7}	7.064	0.185	9.35×10^{6}	6.971	0.159	2.20×10^{5}	5.343	2.820
6	GALLEY	1.92×10^{7}	7.282	2.313	1.49×10^{7}	7.174	2.168	1.68×10^{6}	6.226	0.684
4	HEAD	4.89×10^{5}	5.690	0.471	3.77×10^{5}	5.577	0.396	4.36×10^{4}	4.639	0.572
5	HEAD	3.44×10^{5}	5.537	0.661	2.42×10^{5}	5.383	0.780	1.37×10^{4}	4.137	0.656
6	HEAD	1.32×10^{5}	5.121	0.733	1.24×10^{5}	5.095	0.739	8.55×10^{4}	4.932	1.051
4	SHOWER	2.48×10^{6}	6.394	0.557	2.14×10^{6}	6.331	0.411	2.43×10^{6}	6.385	0.345
5	SHOWER	1.69×10^{6}	6.228	0.584	1.63×10^{6}	6.213	0.585	6.00×10^{4}	4.778	0.633
6	SHOWER	1.90×10^{6}	6.279	1.203	1.64×10^{6}	6.215	1.132	6.67×10^{5}	5.824	2.100
SAILBOAT										
7	GALLEY	6.28×10^{4}	4.798	7.213	4.56×10^{4}	4.659	7.192	1.51×10^{4}	4.180	1.053
8	GALLEY	2.16×10^{7}	7.335	1.369	1.20×10^{7}	7.079	1.700	9.13×10^{3}	3.961	1.825
9	GALLEY	6.20×10^{7}	7.792	0.144	5.96×10^{7}	7.776	0.153	1.13×10^{4}	4.052	0.157
7	HEAD	1.44×10^{5}	5.159	1.012	7.91×10^{4}	4.898	1.442	1.85×10^{3}	3.267	0.643
8	HEAD	2.10×10^{6}	6.323	0.629	1.19×10^{6}	6.075	0.519	4.50×10^{5}	5.653	0.520
9	HEAD	7.86×10^{6}	6.896	0.155	3.38×10^{6}	6.529	0.463	2.59×10^{6}	6.413	0.304
7	SHOWER	9.74×10^{4}	4.988	0.723	4.56×10^{4}	4.659	0.828	6.18×10^{3}	3.791	1.158
8	SHOWER	1.60×10^{6}	6.205	0.212	1.11×10^{6}	6.045	0.235	2.65×10^{4}	4.423	0.717
9	SHOWER	3.35×10^{6}	6.526	0.141	3.24×10^{6}	6.510	0.150	7.00×10^{4}	4.845	0.579

Notes: * Each crew typically collected 8 samples from each fixture.

** Only 2 samples collected.

Fecal coliforms based on presumptive analysis only. Later (confirmatory) analysis showed different results (see Appendix 1, pp. 19, 20).

Fig. 3-1 SUMMARY OF BACTERIOLOGICAL RESULTS OF ON-BOARD SAMPLING BY BOAT, CREW AND FIXTURE*

		FECAL COLIFORMS			E. COLI			PSEUDOMONAS AERUGINOSA		
Crew	Boat	Geo. Mean Concentration (/100ml)	Mean of Log	Variance of Log	Geo. Mean Concentration (/100ml)	Mean of Log	Variance of Log	Geo. Mean Concentration (/100ml)	Mean of Log	Variance of Log
GALLEY SINK										
1	HOUSE	1.40×10^7	7.146	0.662	1.07×10^7	7.028	0.918	9.42×10^2	2.974	0.590
2	HOUSE	6.54×10^8	8.816	0.148	2.68×10^8	8.428	0.152	1.71×10^4	4.234	2.835
3	HOUSE	1.94×10^8	8.287	0.292	6.14×10^7	7.789	0.406	1.00×10^4	4.000	0.286
4	POWER	6.19×10^7	7.792	0.756	5.30×10^7	7.724	0.654	3.51×10^5	5.545	2.198
5	POWER	1.16×10^7	7.064	0.185	9.35×10^6	6.970	0.159	2.20×10^5	5.343	2.820
6	POWER	1.92×10^7	7.282	2.313	1.49×10^7	7.173	2.168	1.68×10^6	6.226	0.684
7	SAIL	6.28×10^4	4.798	7.213	4.56×10^4	4.660	7.192	1.51×10^4	4.180	1.053
8	SAIL	2.16×10^7	7.335	1.369	1.20×10^7	7.079	1.700	9.13×10^3	3.961	1.825
9	SAIL	6.20×10^7	7.792	0.144	5.96×10^7	7.776	0.153	1.13×10^4	4.052	0.157
HEAD SINK										
1	HOUSE	2.99×10^6	6.476	1.787	2.24×10^6	6.349	1.637	1.09×10^3	3.037	0.780
2	HOUSE	1.34×10^7	7.128	0.052	3.22×10^6	6.508	0.274	1.43×10^4	4.156	0.153
3	HOUSE	9.88×10^6	6.995	0.064	2.57×10^6	6.409	0.237	3.07×10^4	4.488	0.198
4	POWER	4.89×10^5	5.690	0.471	3.77×10^5	5.577	0.396	4.36×10^4	4.639	0.572
5	POWER	3.44×10^5	5.537	0.661	2.42×10^5	5.383	0.780	1.37×10^4	4.137	0.656
6	POWER	1.32×10^5	5.121	0.733	1.24×10^5	5.095	0.739	8.55×10^4	4.932	1.051
7	SAIL	1.44×10^5	5.159	1.012	7.91×10^4	4.898	1.442	1.85×10^3	3.267	0.643
8	SAIL	2.10×10^6	6.323	0.629	1.19×10^6	6.075	0.519	4.50×10^5	5.653	0.520
9	SAIL	7.86×10^6	6.896	0.155	3.38×10^6	6.529	0.463	2.59×10^6	6.413	0.304
SHOWER										
1	HOUSE	1.23×10^6	6.088	1.279	4.56×10^5	5.659	1.431	1.86×10^2	2.269	0.437
2	HOUSE	1.49×10^7	7.173	0.272	5.37×10^6	6.730	0.463	4.58×10^3	3.660	0.922
3	HOUSE **	4.69×10^5	5.671	0.001	4.53×10^5	5.656	0.002	3.00×10^4	4.476	1.856
4	POWER	2.48×10^6	6.394	0.557	2.14×10^6	6.331	0.411	2.43×10^6	6.385	0.345
5	POWER	1.69×10^6	6.228	0.584	1.63×10^6	6.213	0.585	6.00×10^4	4.778	0.633
6	POWER	1.90×10^6	6.279	1.203	1.64×10^6	6.215	1.132	6.67×10^5	5.824	2.100
7	SAIL	9.74×10^4	4.988	0.723	4.56×10^4	4.659	0.828	6.18×10^3	3.791	1.158
8	SAIL	1.60×10^6	6.205	0.212	1.11×10^6	6.045	0.235	2.65×10^4	4.423	0.717
9	SAIL	3.35×10^6	6.526	0.141	3.24×10^6	6.510	0.150	7.00×10^4	4.845	0.579

Notes: * Each crew typically collected 8 samples from each fixture.

** Only 2 samples collected.

Fecal coliforms based on presumptive analysis only. Later (confirmatory) analysis showed different results (see Appendix 1, pp. 19, 20).

Fig. 3-2 SUMMARY OF BACTERIOLOGICAL RESULTS OF ON-BOARD SAMPLING BY FIXTURE,* CREW AND BOAT*

Sample Location	Total Phosphorus (mg/l)	Soluble Phosphorus (mg/l)	Total Solids (mg/l)	Suspended Solids (mg/l)	BOD5 (mg/l)	COD (mg/l)	TOC (mg/l)	Ammonia-N (mg/l)	TKN (mg/l)
SAILBOAT									
GALLEYSINK	1	0.26	710	100	180	1320	175	0.03	6.3
GALLEYSINK	3.7	3.2	870	116	300	1105	200	7.15	46
GALLEYSINK	1.12	0.83	2100	61	168	520	140	0.07	10.1
HEADSINK	1.015	0.65	400	74.5	120	250	30	0.02	4.5
HEADSINK	0.64	0.35	270	140	32	350	21	0.01	2.8
HEADSINK	1.65	1.09	350	210	60	230	35	0.11	6.9
SHOWER	0.194	0.004	330	142	41	330	9	3	5.9
SHOWER	0.3	0.005	290	146	21	345	10	0.53	2.9
SHOWER	0.49	0.005	510	148	9.9	920	70	1.17	9.3
MEAN CONC.	1.12	0.71	647.78	126.39	103.54	596.67	76.67	1.34	10.52
STANDARD ERROR OF MEAN	0.336	0.318	182.674	14.074	30.505	128.714	23.563	0.750	4.255
POWERBOAT									
GALLEYSINK	8.6	6.3	3800	2300	1360	2600	1330	21	51
HEADSINK	1.18	0.76	5800	138	120	340	73	0.01	6.5
SHOWER	1.38	1.02	305	37	42	117.5	22	9.9	17.4
GALLEYSINK	27	27	2600	520	920	2100	1100	35	172
HEADSINK	0.98	0.35	620	220	230	390	100	0.03	5.2
SHOWER	5.45	4.3	650	330	129	550	50	2.9	23/22
GALLEYSINK	24	25	3300	2000	1090	3700	880	2.5	90
HEADSINK	1.72	1.1	660	380	220	650	180	0.01	16.8
SHOWER	8.3	5.9	530	106	102	290	70	90	90
MEAN CONC.	8.73	7.97	2029.44	670.11	468.11	1193.06	422.78	17.93	49.88
STANDARD ERROR OF MEAN	3.139	3.293	611.400	268.795	159.337	402.771	164.81	9.287	18.138
HOUSEBOAT									
GALLEYSINK	16.3	15.1	4100	570	2600	4000	1920	4	117
GALLEYSINK	2.4	1.66	670	188.5	590	620	345	0.1	23
HEADSINK	0.038	0.014	148	11.5	60	67	7	0.05	0.34
HEADSINK	0.38	0.005	610	280	140	650	50	13.7	33
SHOWER	0.112	0.004	210	17.6	12.4	87	13.5	2	8.7
SHOWER	0.86	0.24	650	290	430	760	190	3.2	24
GALLEYSINK	14.4	13.9	7700	2800	410	8900	6100	22	155
HEADSINK	4.1	2.4	1390	830	320	850	320	0.05	33
SHOWER	0.27	0.126	510	182	69	470	68	0.72	8.1
MEAN CONC.	4.32	3.72	1776.44	574.40	514.60	1822.67	1001.50	5.09	44.68
STANDARD ERROR OF MEAN	2.015	1.942	795.046	274.783	253.574	913.891	629.857	2.407	16.913

Fig 3-3 GREY WATER CHEMICAL CHARACTERIZATION

Sample Location	Total Phosphorus	Soluble Phosphorus	Total Solids	Suspended Solids	BOD_5	COD	TOC	Ammonia-N	TKN
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)
BY BOAT									
Sail Boat	1.12	0.71	648	126	104	597	77	1.3	11
Power Boat	8.73	8.0	2029	670	468	1193	423	18	50
House Boat	4.32	3.7	1776	574	515	1823	1002	5.1	45
BY FIXTURE									
Galley Sink	11	10.4	2872	962	846	2763	1354	10.2	74
Head Sink	1.30	0.75	1139	254	145	420	91	1.6	12
Shower	1.93	1.3	443	155	95	430	55	12.6	18.5
RAW SEWAGE*									
High	15	10	1200	350	400	1000	290	50	75
Low	4	3	350	100	110	250	80	12	20

* Waste Water Engineering: Treatment Disposal Re-use Metcalf & Eddy, 1979

Fig. 3-4 MEAN VALUES GREY WATER CHEMICAL AND BIOCHEMICAL CHARACTERISTICS

SAMPLE SOURCE	PER CAPITA WATER USE (l/c/d)	NUMBER OF PERSONS	TOTAL PHOSPHORUS (kg/d)	SOLUBLE PHOSPHORUS (kg/d)	TOTAL SOLIDS (kg/d)	SUSPENDED SOLIDS (kg/d)	BOD_5 (kg/d)	COD (kg/d)	TOC (kg/d)	AMMONIA-N (kg/d)	TKN (kg/d)
BY BOAT											
SAIL BOAT	17	4	0.0004	0.0004	0.1216	0.0387	0.0321	0.1058	0.0474	0.0006	0.0030
POWER BOAT	22	4	0.0005	0.0005	0.1590	0.0506	0.0419	0.1383	0.0620	0.0008	0.0039
HOUSE BOAT	20	6	0.0008	0.0007	0.2198	0.0700	0.0580	0.1913	0.0857	0.0010	0.0054

Fig. 3-5 GREY WATER DISCHARGE LOADINGS

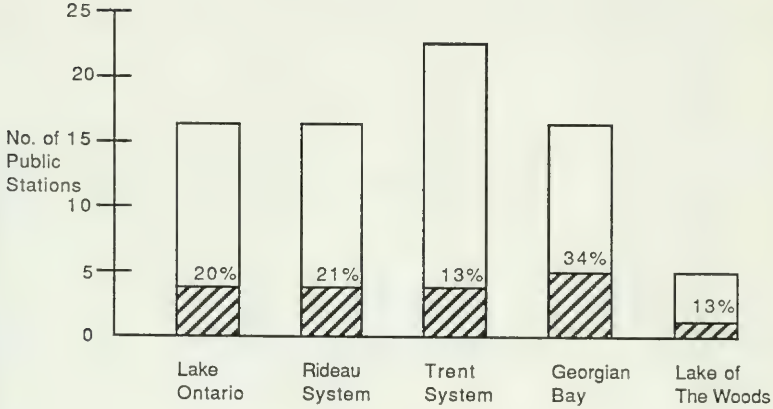
Beak Consultants Ltd.

	FECAL COLIFORM		E. COLI		P. AERUGINOSA	
Event No.	Geometric Mean (#/100 ml)	Background (#/100 ml)	Geometric Mean (#/100 ml)	Background (#/100 ml)	Geomtric Mean (#/100 ml)	Background (#/100 ml)
BLIND CHANNEL						
1	4	2	2	2	1	1
2	7	80	3	1	1	1
3	4	1	1	1	1	1
4	3	76	3	70	1	1
5	3	2	2	2	1	1
6	6	36	4	26	1	1
7	1	2	1	2	1	1
8	2	1	2	1	1	1
9	2	1	2	1	2	1
10	1	1	1	1	1	1
11	1	2	1	2	1	1
12	2	2	1	2	1	2
FRYING PAN BAY						
1	51	4	17	1	54	9
2	163	1	81	1	37	48
3	293	2	108	1	89	41
4	189	28	45	28	21	44
5	203	10	71	10	16	2
6	360	29	204	20	9	1
7	50	7	29	6	1	1
8	90	19	26	3	505	400
9	103	6	47	4	38	220
10	75	4	21	2	171	60
11	64	6	21	2	328	1,180
12	89	34	44	15	88	220
LOST BAY						
1	7	2	4	2	23	2
2	7	2	3	2	49	42
3	109	2	74	2	214	56
4	91	34	59	17	14	7
5	105	2	57	2	17	2
6	40	2	38	2	1	1
7	35	2	18	2	2	2
8	31	48	15	10	213	200
9	23	1	15	1	20	77
10	23	2	17	1	232	210
11	13	2	9	2	140	1050
12	43	106	11	14	58	156

Fig. 3-6 EMBAYMENT BACTERIAL ANALYSES

Crew	House Boat	Power Boat	Sail Boat
1	4.8	13.1	13.3
2	-	31.8	-
3	6.9	20.1	19.9
Mean	5.9	21.7	16.6

Fig. 3-7 FRESH WATER USAGE
(litres/person/day)



* Note: Based on survey of a selected portion of each of these water bodies.

▨ Usage of Available Capacity (%)

Fig. 3-8 PUMP-OUT STATIONS AVAILABLE TO THE PUBLIC

Source of information: Beak Consultants Lt

APPENDIX 4

BOAT PLUMBING SCHEMATICS

NOTES

1. SLEEPING ACCOMMODATIONS FOR 5 - 8 PERSONS.

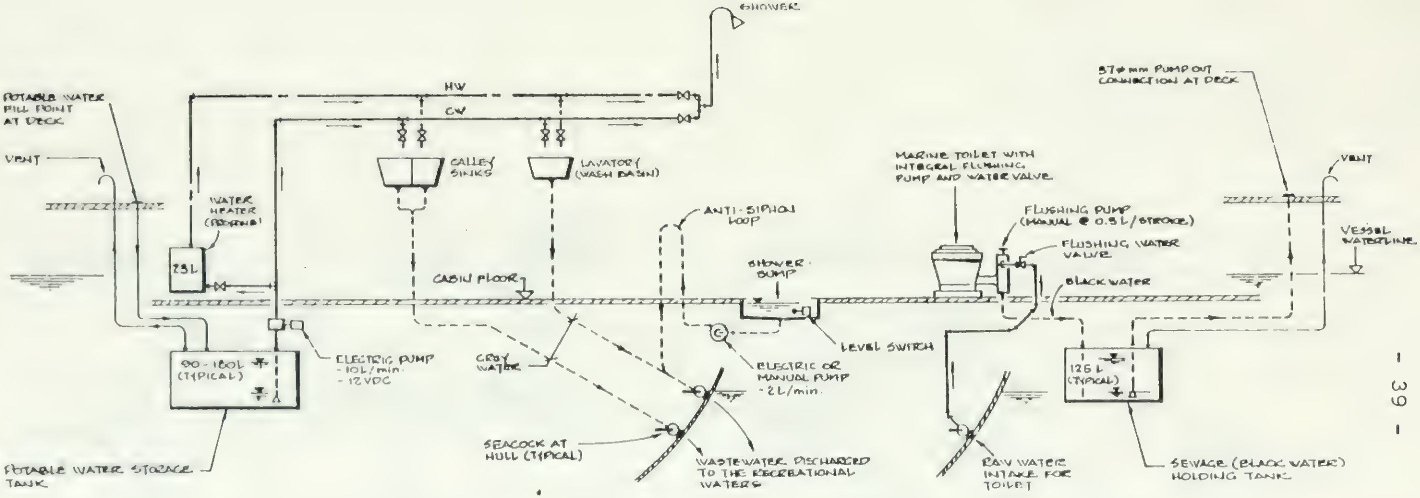

POTABLE WATER FILL POINT AT DECK
VENT
WATER HEATER (PROPANE)
23L
HW
CW
SHOWER
GALLEY SINKS
LAVATORY (WASH BASIN)
CABIN FLOOR
90 - 180L (TYPICAL)
ELECTRIC PUMP - 10L/min. - 12VDC
GREY WATER
POTABLE WATER STORAGE TANK
SEACOCK AT HULL (TYPICAL)
ANTI-SIPHON LOOP
SHOWER SUMP
ELECTRIC OR MANUAL PUMP - 2L/min.
LEVEL SWITCH
WASTEWATER DISCHARGED TO THE RECREATIONAL WATERS
MARINE TOILET WITH INTEGRAL FLUSHING PUMP AND WATER VALVE
FLUSHING PUMP (MANUAL @ 0.5L/STROKE)
FLUSHING WATER VALVE
BLACK WATER
RAW WATER INTAKE FOR TOILET
126 L (TYPICAL)
SEWAGE (BLACK WATER) HOLDING TANK
57ø mm PUMPOUT CONNECTION AT DECK
VENT
VESSEL WATERLINE

Fig. 4.1 TYPICAL LARGER SAILBOAT PLUMBING SYSTEM

(in accordance with existing Reg. 305)

MacLaren Engineers Inc.

NOTES

1. SMALLER: UP TO ROUGHLY 9.5 m LONG
2. SLEEPING ACCOMMODATION FOR 4 TO 6 PERSONS
3. BILGE PUMP FITTED (MANUAL OR ELECTRIC).

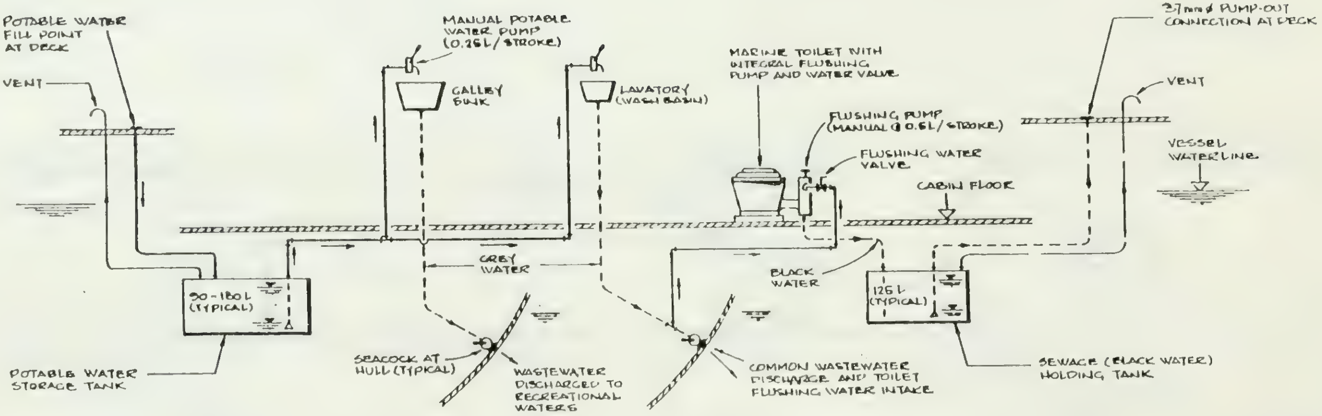

POTABLE WATER FILL POINT AT DECK
VENT
MANUAL POTABLE WATER PUMP (0.26L/STROKE)
GALLEY SINK
LAVATORY (WASH BASIN)
MARINE TOILET WITH INTEGRAL FLUSHING PUMP AND WATER VALVE
FLUSHING PUMP (MANUAL @ 0.6L/STROKE)
FLUSHING WATER VALVE
CABIN FLOOR
37mm ø PUMP-OUT CONNECTION AT DECK
VENT
VESSEL WATER LINE
90-180L (TYPICAL)
GREY WATER
BLACK WATER
126L (TYPICAL)
POTABLE WATER STORAGE TANK
SEACOCK AT HULL (TYPICAL)
WASTEWATER DISCHARGED TO RECREATIONAL WATERS
COMMON WASTEWATER DISCHARGE AND TOILET FLUSHING WATER INTAKE
SEWAGE (BLACK WATER) HOLDING TANK

Fig. 4.2 TYPICAL SMALLER SAILBOAT PLUMBING SYSTEM

(in accordance with existing Reg. 305)

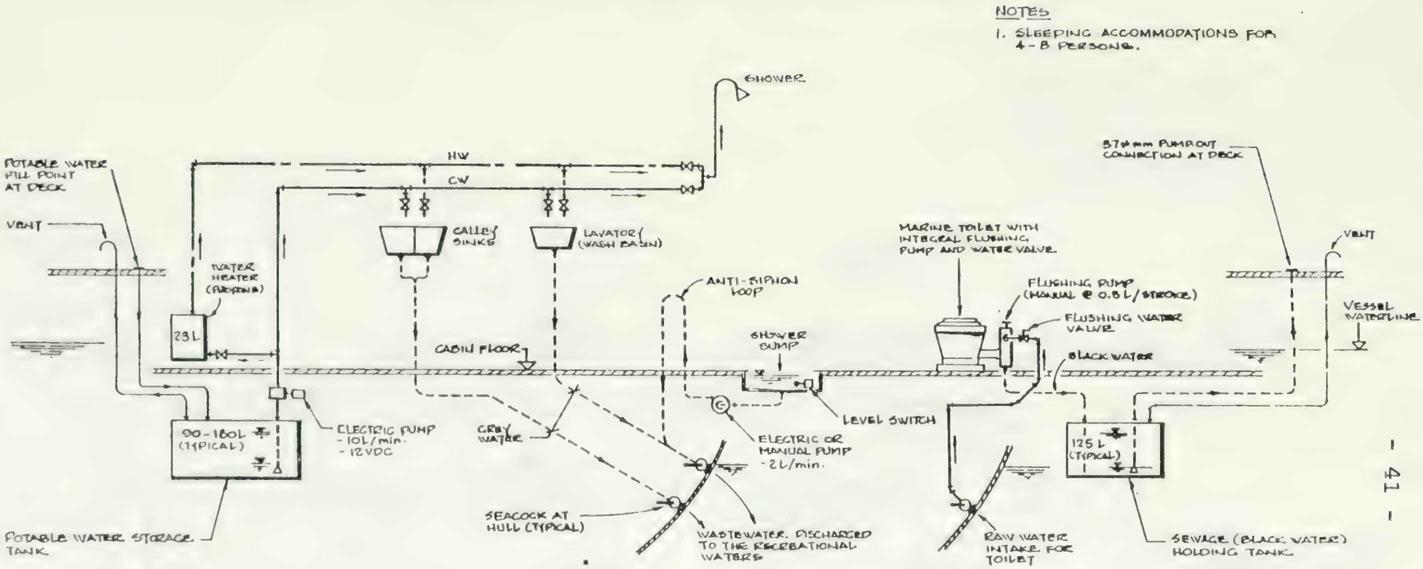

NOTES
1. SLEEPING ACCOMMODATIONS FOR 4-8 PERSONS.
SHOWER
HW
CW
POTABLE WATER FILL POINT AT DECK
VENT
WATER HEATER (PROPANE)
23L
GALLEY SINKS
LAVATORY (WASH BASIN)
CABIN FLOOR
90-180L (TYPICAL)
ELECTRIC PUMP - 10L/min. - 12VDC
GREY WATER
SEACOCK AT HULL (TYPICAL)
POTABLE WATER STORAGE TANK
ANTI-SIPHON LOOP
SHOWER SUMP
LEVEL SWITCH
ELECTRIC OR MANUAL PUMP - 2L/min.
WASTEWATER DISCHARGED TO THE RECREATIONAL WATERS
MARINE TOILET WITH INTEGRAL FLUSHING PUMP AND WATER VALVE
FLUSHING PUMP (MANUAL @ 0.8L/STROKE)
FLUSHING WATER VALVE
BLACK WATER
RAW WATER INTAKE FOR TOILET
57mm PUMPOUT CONNECTION AT DECK
VENT
VESSEL WATERLINE
125 L (TYPICAL)
SEWAGE (BLACK WATER) HOLDING TANK

Fig. 4.3 TYPICAL LARGER POWER CRUISER PLUMBING SYSTEM

(in accordance with existing Reg. 305)

NOTES
1. SMALLER: UP TO ROUGHLY 8.5 m LONG
2. SLEEPING ACCOMMODATION FOR 3 - 4 PERSONS.
3. BILGE PUMP FITTED (MANUAL OR ELECTRIC).

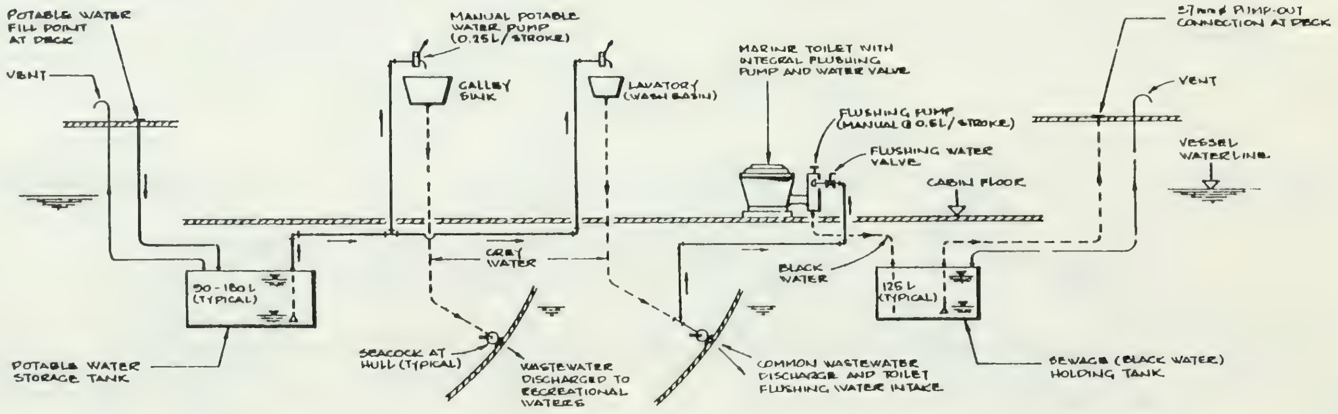
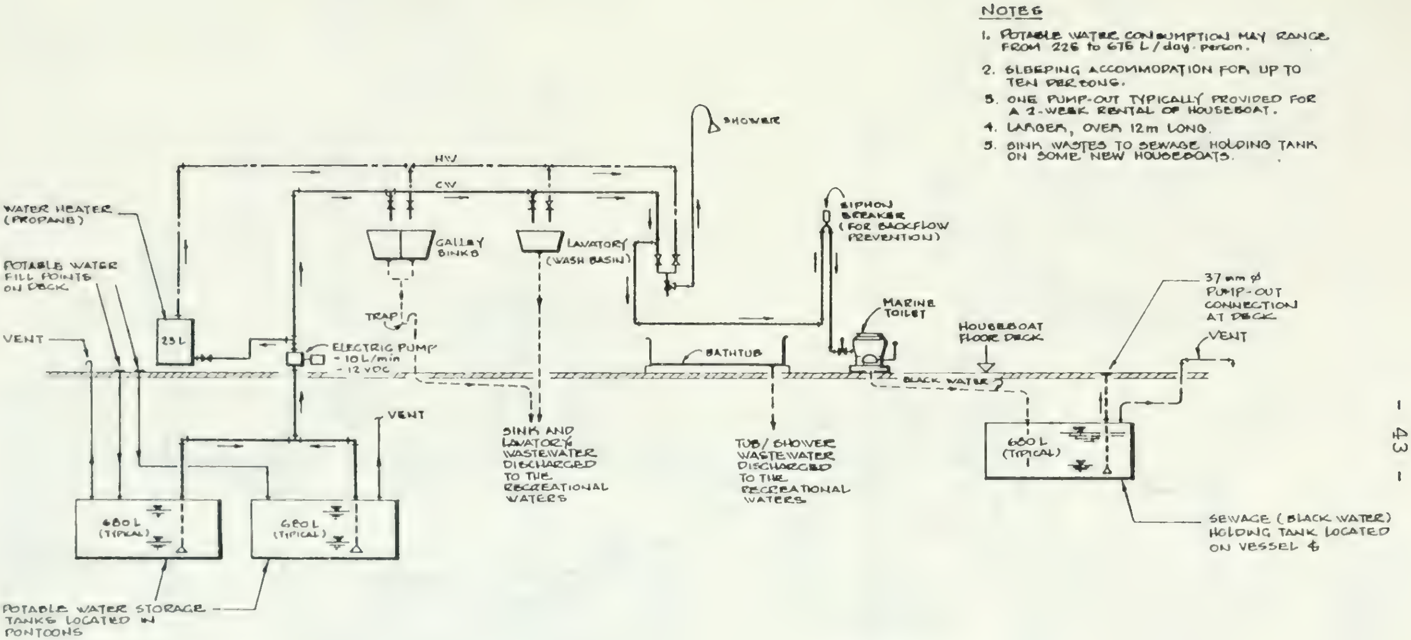

POTABLE WATER FILL POINT AT DECK
VENT
MANUAL POTABLE WATER PUMP (0.25L/STROKE)
GALLEY SINK
LAVATORY (WASH BASIN)
MARINE TOILET WITH INTEGRAL FLUSHING PUMP AND WATER VALVE
FLUSHING PUMP (MANUAL @ 0.5L/STROKE)
FLUSHING WATER VALVE
CABIN FLOOR
57mm ø PUMP-OUT CONNECTION AT DECK
VENT
VESSEL WATERLINE
GREY WATER
BLACK WATER
50 - 180 L (TYPICAL)
125 L (TYPICAL)
POTABLE WATER STORAGE TANK
SEACOCK AT HULL (TYPICAL)
WASTEWATER DISCHARGED TO RECREATIONAL WATERS
COMMON WASTEWATER DISCHARGE AND TOILET FLUSHING WATER INTAKE
SEWAGE (BLACK WATER) HOLDING TANK

Fig. 4.4 TYPICAL SMALLER POWER CRUISER PLUMBING SYSTEM

(in accordance with existing Reg. 305)

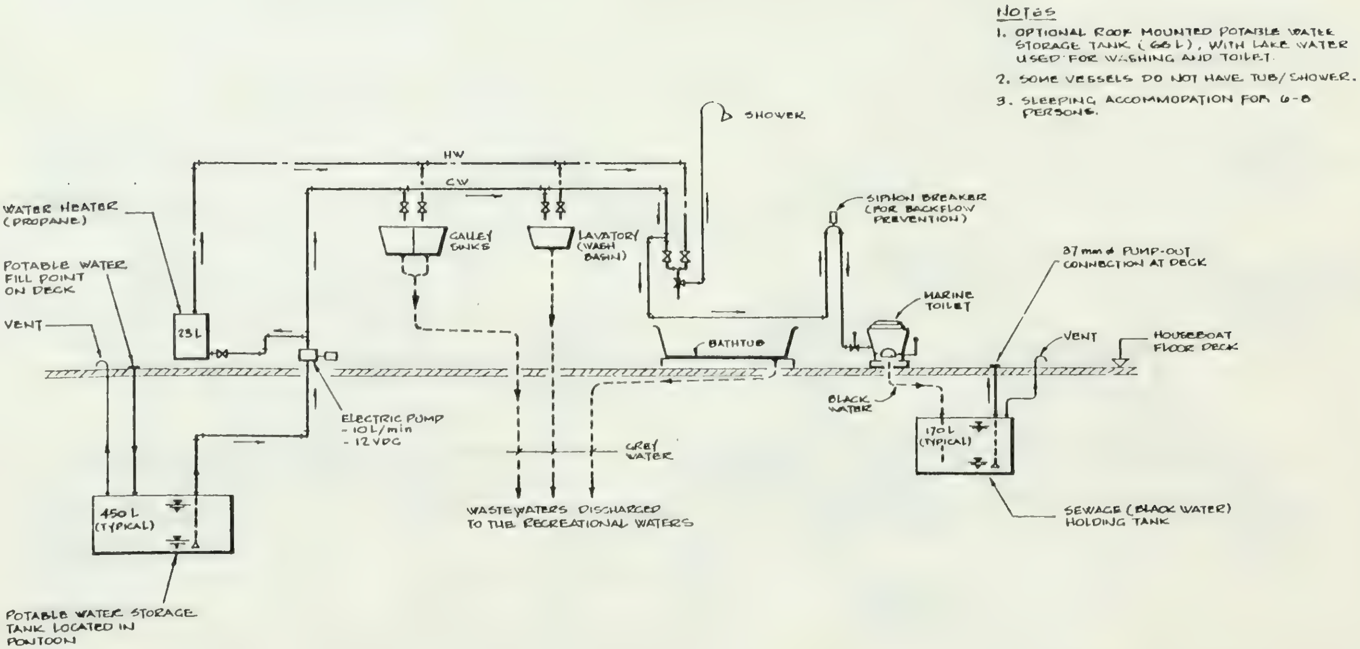
MacLaren Engineers Inc.


WATER HEATER (PROPANE)
POTABLE WATER FILL POINTS ON DECK
VENT
23 L
HW
CW
GALLEY SINKS
LAVATORY (WASH BASIN)
SHOWER
TRAP
ELECTRIC PUMP - 10 L/min - 12 VDC
VENT
680 L (TYPICAL)
680 L (TYPICAL)
POTABLE WATER STORAGE TANKS LOCATED IN PONTOONS
SINK AND LAVATORY WASTEWATER DISCHARGED TO THE RECREATIONAL WATERS
BATHTUB
TUB/SHOWER WASTEWATER DISCHARGED TO THE RECREATIONAL WATERS
SIPHON BREAKER (FOR BACKFLOW PREVENTION)
MARINE TOILET
HOUSEBOAT FLOOR DECK
BLACK WATER
37 mm ø PUMP-OUT CONNECTION AT DECK
VENT
680 L (TYPICAL)
SEWAGE (BLACK WATER) HOLDING TANK LOCATED ON VESSEL ¢

NOTES

1. POTABLE WATER CONSUMPTION MAY RANGE FROM 226 to 676 L/day·person.
2. SLEEPING ACCOMMODATION FOR UP TO TEN PERSONS.
3. ONE PUMP-OUT TYPICALLY PROVIDED FOR A 2-WEEK RENTAL OF HOUSEBOAT.
4. LARGER, OVER 12 m LONG.
5. SINK WASTES TO SEWAGE HOLDING TANK ON SOME NEW HOUSEBOATS.

Fig. 4.5 TYPICAL LARGER HOUSEBOAT PLUMBING SYSTEM
(in accordance with existing Reg. 305)


SHOWER
HW
CW
WATER HEATER (PROPANE)
23L
POTABLE WATER FILL POINT ON DECK
VENT
GALLEY SINKS
LAVATORY (WASH BASIN)
ELECTRIC PUMP - 10L/min - 12VDC
BATHTUB
SIPHON BREAKER (FOR BACKFLOW PREVENTION)
MARINE TOILET
37 mm ∅ PUMP-OUT CONNECTION AT DECK
VENT
HOUSEBOAT FLOOR DECK
BLACK WATER
GREY WATER
170 L (TYPICAL)
450 L (TYPICAL)
WASTEWATERS DISCHARGED TO THE RECREATIONAL WATERS
SEWAGE (BLACK WATER) HOLDING TANK
POTABLE WATER STORAGE TANK LOCATED IN PONTOON

NOTES

1. OPTIONAL ROOF MOUNTED POTABLE WATER STORAGE TANK (68 L), WITH LAKE WATER USED FOR WASHING AND TOILET.
2. SOME VESSELS DO NOT HAVE TUB/SHOWER.
3. SLEEPING ACCOMMODATION FOR 6-8 PERSONS.

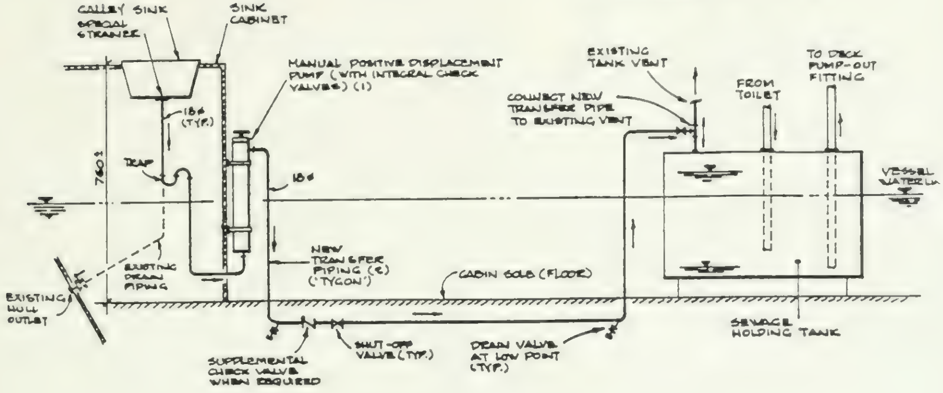
Fig. 4.6 TYPICAL SMALLER HOUSEBOAT PLUMBING SYSTEM

(in accordance with existing Reg. 305)

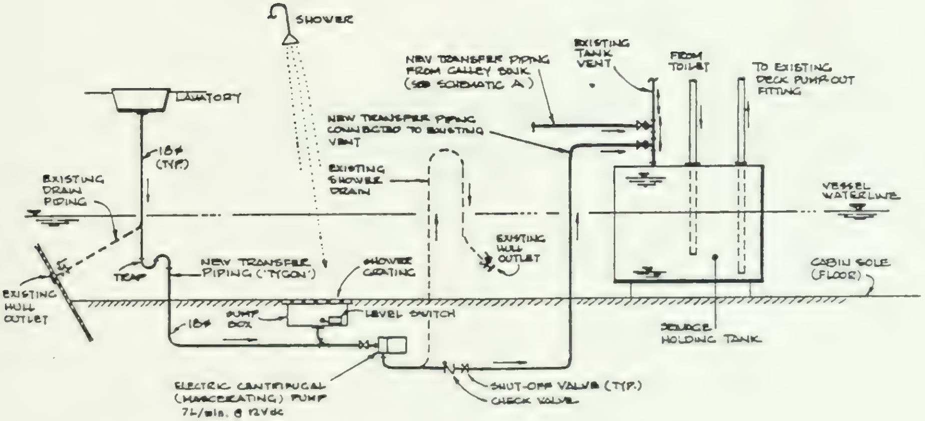
MacLaren Engineers Inc.

NOTES

1. ALTERNATIVE IS ELECTRIC CENTRIFUGAL (MACERATING) TYPE.
2. TRANSFER PIPING CAN ALSO BE RUN ABOVE CABIN SOLE, APPROPRIATELY CONCEALED.



Schematic A - PARTIAL RETENTION SCHEMATIC (FOR GALLEY ONLY)



Schematic B - FULL RETENTION SCHEMATIC

Fig. 4.7 TYPICAL SCHEMATICS FOR GREY WATER RETENTION ON POWER CRUISERS AND SAILBOATS
(if Regulation 305 is amended)

APPENDIX 5

REGULATIONS 305 AND 310
(made under the Environmental Protection Act)
AS EXISTING

REGULATION 305

under the Environmental Protection Act

DISCHARGE OF SEWAGE FROM PLEASURE BOATS

1. In this Regulation,

(*a*) "pleasure boat" means a boat used primarily for the carriage of a person or persons for pleasure, whether on charter or not, and whether for compensation or not, and includes a boat used on water for living purposes;

(*b*) "sewage" means organic and inorganic waste, and includes fuel, lubricants, litter, paper, plastics, glass, metal, containers, bottles, crockery, rags, junk or similar refuse or garbage, and human excrement, but does not include,

(i) liquid wastes, free of solids, from water used in a pleasure boat for household purposes, or

(ii) exhaust wastes, cooling water and bilge water from a pleasure boat;

(*c*) "storage equipment" means equipment of a design and construction suitable for the storage or the incineration and storage of human excrement in a pleasure boat including such equipment that is an integral part of a toilet;

(*d*) "toilet", in relation to a pleasure boat, means equipment designed or used for defecation or urination by humans. R.R.O. 1970, Reg. 644, s. 1; O. Reg. 419/74, s. 1.

2. No person shall discharge or deposit, or cause or permit to be discharged or deposited, into any water, sewage from a pleasure boat. R.R.O. 1970, Reg. 644, s. 2.

3. The owner and the operator of every pleasure boat in which a toilet is installed shall ensure that, while the boat is on water,

(*a*) the boat is equipped with storage equipment; and

(*b*) such toilet and storage equipment are installed so as to be non-portable. R.R.O. 1970, Reg. 644, s. 3; O. Reg. 419/74, s. 2.

4. The owner of a pleasure boat in which a toilet or toilets and storage equipment are installed shall ensure that each toilet and the storage equipment are installed so that,

(*a*) the toilet and equipment are connected in such a manner that the equipment receives all toilet waste from the toilet;

(*b*) equipment designed for the storage of human excrement is provided with a deck fitting and such connecting piping as is necessary for the removal of toilet waste by shore-based pumping equipment;

(*c*) no means of removal of toilet waste is provided other than the means mentioned in clause (*b*);

(*d*) equipment designed for the incineration and storage of human excrement is supplied with such electrical current or other source of heat as is necessary to reduce to ash all excrement deposited therein; and

(*e*) all parts of the system for removal of toilet waste are congruent with one another and the boat. R.R.O. 1970, Reg. 644, s. 5; O. Reg. 419/74, s. 4.

REGULATION 310

under the Environmental Protection Act

MARINAS

1. In this Regulation,

(*a*) "commercial marina" means a place located on or adjacent to a body of water or a watercourse where overnight moorings, moorings for a fee, storage, repairs, or marine fuel are ordinarily provided for or supplied to pleasure boats in which toilets are installed and includes a place operated by a boat or yacht club;

(*b*) "litter" means organic and inorganic waste, except sewage, and includes fuel, lubricants, paper, rags, bottles, glass, plastics, crockery, cans, scrap metal, junk, or similar refuse or garbage;

(*c*) "marina" means a place located on or adjacent to a body of water or a watercourse where moorings or any services are provided for pleasure boats or the occupants thereof, and includes a commercial marina but does not include a place used primarily by the owner thereof for his purposes;

(*d*) "operator" includes the owner or lessee of a marina;

(*e*) "pleasure boat" means a boat used primarily for the carriage of a person or persons for pleasure, whether on charter or not, and whether for compensation or not, and includes a boat used on water for living purposes;

(*f*) "pump-out facility" means a device or equipment for removing sewage from a pleasure boat in which a toilet is installed by the use of hose or pipe connected to a pump or equipment designed to create suction and located other than on the boat from which the sewage is to be removed;

(*g*) "sewage" means all human excrement;

(*h*) "toilet", in relation to a pleasure boat, means equipment designed or used for defecation or urination by humans. R.R.O. 1970, Reg. 646, s. 1.

2. The operator of a marina shall,

(*a*) provide at the marina containers for litter in sufficient number and so located that they can be conveniently used by occupants of pleasure boats;

(*b*) ensure that the containers are maintained in a sound and sanitary condition; and

(*c*) dispose of litter in the containers in accordance with all applicable laws. R.R.O. 1970, Reg. 646, s. 2.

3. The operator of a commercial marina shall,

(*a*) provide at the marina or arrange for at another place a pump-out facility that is easily accessible to and can be conveniently used by occupants of pleasure boats in which toilets are installed that are using the marina;

(*b*) ensure that at all times during the period of operation of the marina any pump-out facility at the marina or arranged for at another place is in good operating condition;

(*c*) remove or cause to be removed sewage from a pleasure boat in which a toilet is installed by means of a pump-out facility at the request of the person in charge of such boat upon payment of fee; and

(*d*) transfer and dispose of sewage from any pump-out facility at the marina, or ensure the transfer and disposal of sewage from any pump-out facility arranged for at another place, in accordance with all applicable laws. R.R.O. 1970, Reg. 646, s. 3.